



## How climate change will affect Victoria's land and biodiversity

### Our planet's climate is changing rapidly

The Earth is undergoing significant changes to its climate. While climatic changes have occurred throughout Earth's history, these recent changes are significant because of their extent and the rapid rate at which they are occurring.

The average global temperature has increased by 0.6°C over the past century and by about 1.0°C in Victoria since 1950. Scientific evidence increasingly supports that most of the observed warming over the past 50 years is attributable to greenhouse gases put into the atmosphere by human activities. There is also widespread evidence (including some from Victoria) that this warming has already had discernable impacts on many biological systems.

In the future, the average global temperature is expected to increase by between 1.1 and 6.4°C by 2100. The legacy of our past actions will mean that temperatures are likely to continue to increase, even if global efforts to significantly cut greenhouse gas emissions are successful.

### Climate change in Victoria

Climate change projections by CSIRO and the Bureau of Meteorology indicate that Victoria will be warmer and drier in the future, particularly in northern Victoria.

Annual temperatures are expected to increase by around 0.8°C by 2030 and significantly more by 2070, depending on the effectiveness of global emissions reductions. As average temperatures rise, it is very likely that days over 35°C will become more frequent, while cold days and frost events will occur less often.

By 2030, average annual rainfall is projected to decrease by around 4%, with the largest changes expected in spring and winter. While average annual rainfall is likely to decrease, extreme daily rainfall events may increase.

Increases in global sea levels are also expected as a result of climate change – in the Fourth Assessment Report (2007) of the Intergovernmental Panel on Climate Change sea level rises of 0.18 to 0.59 metres are predicted by the end of this century. Polar ice sheet melt may increase this to as much as 0.79 metres.

Changes in average temperature will influence a range of other climate variables, including factors such as storm frequency and intensity, humidity, snow conditions and cloud cover.

Regional projections are available at [www.climatechange.vic.gov.au](http://www.climatechange.vic.gov.au)

### Summary of projected annual temperature and rainfall changes for Victoria under different climate change scenarios

Numbers in blue refer to the 'most likely' change.

The numbers in brackets below refer to the full range of potential change predicted by the climate change models.

Annual	2030	2070	
	Most likely	Lower emissions	Higher emissions
Average temperature	<b>0.8°C</b> (0.7 to 1.2°C)	<b>1.4°C</b> (0.9 to 2°C)	<b>2.7°C</b> (1.8 to 3.8°C)
Average Rainfall (%)	<b>-4%</b> (-9 to +1%)	<b>-6%</b> (-14 to -2%)	<b>-11%</b> (-25 to -3%)

## The impacts of climate change

While Victoria already experiences a variable climate, climate change is expected to interact with and enhance this variability. The drought / fire / flood cycle that plays a large part in determining Victorian land-based environments will be amplified meaning that our knowledge of historical climates may no longer be the best guide to the future.

Climate change will impact Victoria's water resources, bushfire frequency and intensity, primary production and the economy as a whole. It is likely there will be more extreme events such as flood and cyclones that will impact both Victorian communities and the environment. Climate change will also affect the richness of our biodiversity and the health of our landscapes. Habitats for critical species may be limited and changing weed distributions could place new pressures on the ecosystems. These effects will affect constraints on resources such as arable land, water and energy, and could increase pressure on land management.

## Climate change and biodiversity

Significant climate change impacts on biodiversity have already been identified with up to 50% of the species studied worldwide observed to be affected. The Intergovernmental Panel on Climate Change concludes that if global temperature increases exceed 2 to 3°C above pre-industrial levels, 20 to 30% of plant and animal species assessed are likely to be at increasingly high risk of extinction.

The effects of climate change on biodiversity are far-reaching and operate at many different levels – from individuals to ecosystems. Climate change affects individual species in different ways. It may alter their distribution, abundance, behaviour, phenology (the timing of events such as migration or breeding), morphology (size and shape) and genetic composition. The most susceptible species will be those with restricted ranges, specialised habitat requirements, poor ability to move around or small populations. It will force changes in the ranges of many species. Some will not be able to move fast enough, and the composition of ecosystems may change as different species respond in different ways.

Climate change will also have important indirect impacts on species. There may be increased pressure from competitors, predators, parasites, diseases and disturbances (such as bushfires or drought).

It will influence the composition of ecosystems and their distribution by altering water flows in rivers and wetlands, changing the occurrence of bushfires and floods as well as altering dryland and estuarine salinity levels. Climate change impacts will often act in combination with major existing threats such as habitat loss and invasive species, making their impacts considerably worse.

In addition, increases in carbon dioxide (CO<sub>2</sub>) concentrations that are causing climate change will have a direct effect on both terrestrial and marine ecosystems. Over the short term, some plants, including trees and most agricultural crops, are expected to respond positively to rising CO<sub>2</sub> concentrations because higher photosynthesis rates increase biomass (IPCC 2001). Increased carbon dioxide absorption into the oceans could change the acidity of the seawater, affecting marine life in ways we may not even be aware of.

## Challenges and opportunities

Climate, biodiversity, and human well-being are inextricably linked. Further climate change is expected to magnify land and biodiversity decline, however our understanding of these issues, the relevant processes and their inter-relationships is far from complete.

The continuing and accelerating loss of biodiversity may compromise the long-term ability of ecosystems to regulate the climate, may amplify climate impacts and could lead to additional, unforeseen, and potentially irreversible shifts in biological systems. Action now to halt further loss or degradation of biodiversity could help to maintain future options for tackling climate change and managing its impacts.

Climate change also provides opportunities for Victoria. For example, we can capitalise on the emerging global carbon market, particularly the market for carbon offsets. The challenge is to develop carbon offsets using new technologies that can increase land productivity, reduce our environmental impact and improve biodiversity.

## Further resources

[www.climatechange.vic.gov.au](http://www.climatechange.vic.gov.au)  
[www.climatechangeinaustralia.gov.au](http://www.climatechangeinaustralia.gov.au)  
[www.ipcc.ch](http://www.ipcc.ch)  
[www.greenhouse.gov.au](http://www.greenhouse.gov.au)

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